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Attoneys for Defendant
Philip Morris Incorporated

APR [illegible] 1982

IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

JAMES T. CLAY and TIMOTHY J. CLAY, Plaintiffs, vs. PHILIP MORRIS CORPORATION, THE TOBACCO INSTITUTE, and DOES 1 through 100, inclusive, Defendants.	NO. C 81 3096 WWS AFFIDAVIT OF DR. THOMAS B. OWEN Date: May 28, 1982 Time: 11:00 a.m.

Dr. Thomas B. Owen, being duly sworn upon his oath, deposes and says:

1. I am presently Program Director of the Smoking and Health Program, Division of Cancer Cause and Prevention, National Cancer Institute in the Department of Health and Human Services.

1002802985

Source: https://www.industrydocuments.ucsf.edu/docs/gfyl0000

2. Attached to this affidavit as Exhibit "A" is a true and accurate copy of a November 28, 1973 report from the Naylor Dana Institute for Disease Prevention entitled "Analysis of Mainstream and Sidestream Smoke of Cigarettes Treated with Colite", and a November 30, 1973 cover letter from Dr. Dietrich Hoffman, Chief of the Division of Environmental Carcinogenesis with the Naylor Dana Institute to Dr. Gio B. Gori of the Division of Cancer Cause and Prevention.

3. The Naylor Dana Institute report attached as Exhibit "A" was prepared by the Naylor Dana Institute at the request of the Division of Cancer Cause and Prevention.

4. I am competent to testify to the matters stated herein.

Dr. Thomas B. Owen

STATE OF ~~NEW YORK~~ Maryland)
) SS.
COUNTY OF Montgomery)

Now on this 23rd day of March, 1982, personally appeared before me Dr. Thomas B. Owen, and after being duly sworn upon his oath, signed the foregoing affidavit and stated that the facts set forth in such affidavit are known to him to be true.

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Subscribed and sworn to before me this 23rd day of March, 1982.

Bonnie L. Laffitt
Notary Public

My Commission Expires:
7/1/82

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for [illegible]
2 East End Avenue, New York, N.Y. 10[illegible] • (212) 489-8700

D-8
6-3-80
DMP

November 30, 1973

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Gio B. Gori, Ph.D.
Acting Deputy Director
Division of Cancer Cause and Prevention
National Cancer Institute
Bldg. 31, Room 11A03
Bethesda, Md. 20014

Dear Dr. Gori:

Please find enclosed our short report on the cigarettes treated with "Colite". As you recall, the cigarettes you sent to us were Philip Morris Multifilter (85 mm).

Sincerely yours,

Dieter

Dietrich Hoffmann, Ph.D.
Chief
Division of Environmental Carcinogenesis

DH/ep

Enclosures

cc: E.L. Wynder, M.D.
President and Medical
Director

1002802988

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G. GORI

EXHIBIT A

AFFIDAVIT OF DR. THOMAS B. OWEN

Research Unit of The American Health Foundation

Source: https://www.industrydocuments.ucsf.edu/docs/gfyl0000

Report of November 28, 1973

ANALYSIS OF MAINSTREAM AND SIDESTREAM SMOKE OF CIGARETTES TREATED WITH COLITE

During recent decades, a large number of changes and modifications were introduced and suggested for the reduction of total particulate matter, nicotine, and other toxic compounds in the smoke of cigarettes.[1-4] The suggested and applied modifications include changes in the cigarette paper, especially with respect to porosity and burning rate.[1-7] One patent describes the treatment of cigarette paper with "Colite", a fire retarding material, to reduce particulates in mainstream and sidestream smoke.[7] It was the purpose of this investigation to analyze the mainstream smoke of a popular U.S. cigarette with filter tip for total particulate matter (TPM), nicotine, CO and CO_2 before and after treatment of the cigarette with "Colite". In addition, we also analyzed the sidestream smoke of these cigarettes for TPM and nicotine.

EXPERIMENTAL

1. Cigarettes

The National Cancer Institute sent the following cigarettes for testing:

1. 300 popular U.S. cigarettes (85 mm) with filter tip. The filter tip, 30 mm long, consisted of 4 mm overwrap, 11 mm charcoal column (Section I) and 15 mm cellulose acetate column (Section II).

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2. 00 cigarettes as under (1) but cigarette paper treated with "Colite".

2A. Cigarettes as in (2) but smoking the same number of puffs as Control Cigarettes.

3. 40 popular U.S. cigarettes (85 mm) as under (1); however, 25 mm of the tobacco column was replaced by a cellulose acetate filter tip (total filter length with overwrap 55 mm).

Figure 1 shows cigarettes type 1, 2, and 3.

The cigarettes were stored for 24 hrs in a humidity chamber (Heinr. Borgwaldt; Air Conditioning Chamber) at 22° and at 60% relative humidity. Subsequently, the cigarettes were selected by average weight (± 20 mg of average weight of 200 cigarettes) and stored for another 24 hrs. Cigarettes type 1 and 2 were measured for draw resistance with Filtrona Pressure Drop Tester 3LP[B] at an air flow rate of 17.5 ml/sec. Only those cigarettes were used which were within ± 7% of the draw resistance of 50 cigarettes selected by weight. In the case of cigarette type 3 we had to take the average weight of 40 cigarettes. Since we obtained only 11 cigarettes within ± 20 mg of the average weight, we did not have enough cigarettes to select by draw resistance.

2. Free Burning Rate

Originally we intended to determine, for all cigarettes, the free burning rate of a 40 mm cigarette column using the Filtrona Free Burning Rate Meter, MK-II. During the test, however, we observed that the cigarettes treated with "Colite"

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(types 2 and 3) burnt free for only a limited length. We measured, therefore, only the burning rate of a short tobacco column before it self-extinguished.

3. Smoking of Cigarettes

After 24 hrs of additional storage in the humidity chamber, the cigarettes selected by weight and draw resistance of types 1 and 2 and the cigarettes of type 3 selected by weight only were smoked under standard conditions with a Phipps and Bird 20 channel automatic smoking machine. The conditions were one puff of two seconds once a minute with a puff volume of 35 ml and the following butt lengths:

Cigarette type 1, 33 mm;
Cigarette type 2, 33 mm; and
Cigarette type 2A, butt length was given by the number of puffs it took control cigarette type 1 to reach 33 mm butt length
Cigarette type 3, 58 mm.

4. TPM and Nicotine in Mainstream Smoke

TPM for the mainstream smoke of the cigarettes type 1 and 3 were determined according to the FTC method from four times four cigarettes each.[10] The moisture content of the wet TPM from two times four cigarettes was determined by gas chromatography.[11] In the case of cigarette type 3, we smoked only two times three cigarettes; the moisture content was determined from the TPM of these cigarettes, and the nicotine from the TPM of the other three cigarettes. Nicotine was determined by gas chromatography

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using ^{14}C-labelled nicotine as internal standard.[12] In the case of cigarettes type 1, 2, and 2A, nicotine was determined from the TPM of two times four cigarettes.

5. Carbon Monoxide an Carbon Dioxide

Three cigarettes, selected by weight and draw resistance (in case of cigarette type 3, only selected by weight), were smoked under standard conditions through Cambridge filters (CM-113) with a Heinr. Borgwaldt, single channel piston type machine.[14] The gas phase of the individual puffs was blown into a Teflon bag with 1.2 l capacity.[14] From the composite gas phase of all puffs, we injected a small aliquot through a gas dual sampling valve (loop size 0.5 ml) into a 5700A Hewlett-Packard gas chromatograph which was equipped with a thermal conductivity (t.c.) detector. The column eployed measured 6 mm (i.d.) and was packed with the following"sandwich": silica gel (20/100 mesh), 2.0 m; iodine pentoxide, 0.3 m; silver powder, 0.05 m; silica gel, 1.65 m. Within the column, the CO was first separated from CO_2 and, subsequently, oxidized to CO_2. The retention times for CO and CO_2 were 3 and 6 minutes, respectively.

6. TPM and Nicotine in Sidestream Smoke

For the determination of the TPM and nicotine in the sidestream smoke, we smoked the cigarettes under standard conditions in a specially designed smoking chamber (Fig. 2; 15). The air flow through the chamber for sidestream smoke generation was 25 ml per second. We connected the Cambridge filter to the exit port of the chamber for the collection of the sidestream TPM and nicotine.

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From cigarette type 1, 2, and 2A, we smoked four times four cigarettes and from cigarette type 3 only two cigarettes. The sidestream TPM, moisture content and nicotine were determined as under (5) of the "Experimental" (vide supra).

RESULTS AND DISCUSSION

In Table 1 we have summarized our findings on the mainstream smoke of "Colite" treated cigarettes (type 2), "Colite" treated cigarettes with extended filter tip (type 3), and untreated control cigarettes (type 1). As can be seen from the burning rates as well as from Figure 3 the "Colite" treated cigarettes burn poorly and result in an ash formation which varies greatly from that of commercial cigarettes. The burning rate of the "Colite" treated cigarette was retarded and the draw resistance slightly increased and, therefore, it took about five more puffs to reach the 33 mm butt length compared to the untreated (control) cigarette. As expected, therefore, the "Colite" treated cigarettes deliver more TPM (+ 45%), nicotine (+ 36%), carbon monoxide (+ 56%), and carbon dioxide (+ 50%) than untreated control cigarettes. Comparing 7.9 puffs of the control cigarette (to reach the 33 mm butt length) with 8.0 puffs of the experimental cigarette (2A) we found that the latter was smoked only to a butt length of 51 mm and resulted in reduced values for TPM (- 24%; FTC = TPM, see footnote under Table 1), nicotine (- 19%), carbon monoxide (- 21%), and carbon dioxide (- 22%). We also smoked cigarettes with mannually extended filter tips (type 3). These cigarettes had high draw resistance reflecting high filtration potential

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and were expected to deliver less TPM and nicotine, but relatively high amounts of water, as a result of reverse selectivity.[16] Carbon monoxide and carbon dioxide deliveries were as one may have expected in the smoke of a cigarette with a 27 mm tobacco column.

The sidestream smoke values for TPM and nicotine were significantly lower for the "Colite" treated cigarettes than the untreated cigarettes. This result can be explained, at least in part, by the lower burning rate of the "Colite" treated cigarettes.

In summary, the "Colite" treatment of cigarette paper results in a cigarette which has a low burning rate, requires more puffs to reach standard butt length and, therefore, delivers more "tar" (TPM), nicotine, carbon monoxide and carbon dioxide in the mainstream smoke. Despite the limited data obtained in this study, one may conclude that the "Colite" treatment does not offer an encouraging method for developing the less harmful cigarette.

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8. Cigarette Components Ltd., Instrument Division, London, England Filtrona Pressure Drop Tester Mark 4LP, 1972

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11. Schultz, F.J. and Spears, A.W.: Determination of moisture in total particulate matter. Tobacco Sci., 10: 75076, 1966

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[Since the method is not yet printed we attach the excerpt for the nicotine method.]

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Source: https://www.industrydocuments.ucsf.edu/docs/gfyl0000

13. Heinr. Borgwaldt, Hamburg, Germany: Piston-type smoking machine for single cigarettes. 1971

14. Brunnemann, K.D. and Hoffmann, D.: Chemical studies on tobacco smoke. XXIV. A quantitative method for carbon monoxide and carbon dioxide in cigarette and cigar smoke. J. Chrom. Sci., in print.

[Since the method is not yet printed we attach the "Experimental Part" of the paper.]

15. Brunnemann, K.D. and Hoffmann, D.: Chemical studies on tobacco smoke. XXV. On the pH of tobacco smoke. Food Cosmet. Toxic in print.

16. Waltz, P. and Häusemann, M.: Betrachtungen über die Veränderung des Tabakrauches in der Cigarette. Beitr. Tabakforsch., 3: 169-202, 1965

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Source: https://www.industrydocuments.ucsf.edu/docs/gfyl0000

var ty and stalk positions. . Rathkamp, T.C. Tso, an
. D Hoffmann. Beitr. Tabakf sch., in print

Nicotine

A Cambridge filter packed with the TPM of four cigarettes was placed in a glass vial with 10 ml methanol and shaken mechanically for 2 hrs. Three 10 ml aliquots of the methanol extract were analyzed by gas chromatography on a 4 m column filled with 10% SE-30 on 60/80 mesh Gas Chrom P in conjunction with a flame ionization detector. The injection block temperature was 220° and the column temperature 190°. The average retention times for nicotine and nornicotine were 8.0 and 10.0 min., respectively. The blanks were methanol extracts of unused Cambridge filters. The nicotine values represent an average of two runs of Cambridge filters loaded with the TPM from four cigarettes. The experimental deviation was below ± 5%.

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Source: https://www.industrydocuments.ucsf.edu/docs/gfyl0000

Excerpt from "Chemical studies on tobacco smoke. XXIV. A quantitative method for carbon monoxide and carbon dioxide in cigarette and cigar smoke." K.D. Brunnemann and D. Hoffmann, J. Chrom. Sci., in print

EXPERIMENTAL

Apparatus: A Borgwaldt piston type smoking machine for single cigarettes used for the analysis is connected with a Hewlett-Packard 5700A gas chromatograph equipped with a dual gas sampling valve No. 18718A, a thermal conductivity detector and a 1 mV recorder (Hewlett-Packard Model 7127A). For the collection of the total gas phase of the mainstream of a cigarette or a cigar, we used a Teflon bag (0.5 and 1.2 l, respectively) with a Swagelok fitting, Teflon ferrules, and Teflon stopcock (custom made by Alltech Associates, Arlington Heights, Ill.). Using the gas chromatographic technique described below, we established the loss by diffusion for CO and CO_2 (Fig. 1) using standard gas mixtures in nitrogen of 1.02% CO and 5.01% CO_2, and 5.07% CO and 10.2% CO_2 (Matheson Gas Products). The loss by diffusion of CO and CO_2 from the gas phase of cigarette smoke were identical with those of the standard gas mixtures. (We did not observe significant differences between individual bags). Before each test series, the bags were reexamined.

Material: To establish the reproducibility of our method, we used a popular U.S. cigarette without filter tip (85 mm). This cigarette and other commercial cigarettes, little cigars, and cigars were bought on the open market in New York City during the second half of 1972. The experimental cigarettes were made available by Dr. T.C. Tso of the U.S. Department of Agriculture, Beltsville, Md., and by Dr. G. Gori of the National Cancer Institute, Bethesda, Md.

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Gas Chromatography: The separation of CO and CO_2 from other tobacco smoke compounds and the oxidation of CO to CO_2 was accomplished on a mixed packing column. The stainless steel column measured 1/4 inch (o.d.) by 4 m and was packed in such a way that the gas mixture had to pass through 2 m silica gel (28/100 mesh; Fisher), 0.3 m of iodine pentoxide powder (17 g), 0.05 m of silver powder (3.2 g), and finally through 1.65 m of silica gel (28/200 mesh; Fisher; 5, 10, 12). Thus CO was first separated from the CO_2 and, subsequently, oxidized to CO_2 to ensure separation from N_2 (sat. and unsat. hydrocarbons such as methane or isoprene are not oxidized to CO_2 under these conditions). In practical use, the life time of such a column exceeds 1000 injections of tobacco smoke. The gas chromatographic conditions were: carrier gas 50 ml He/min.; oven 130°; thermal conductivity detector 250°, having a bridge current of 225 mA. The retention times for CO (as CO_2) and CO_2 were 3.2 and 5.2 min., respectively (Fig. 2)

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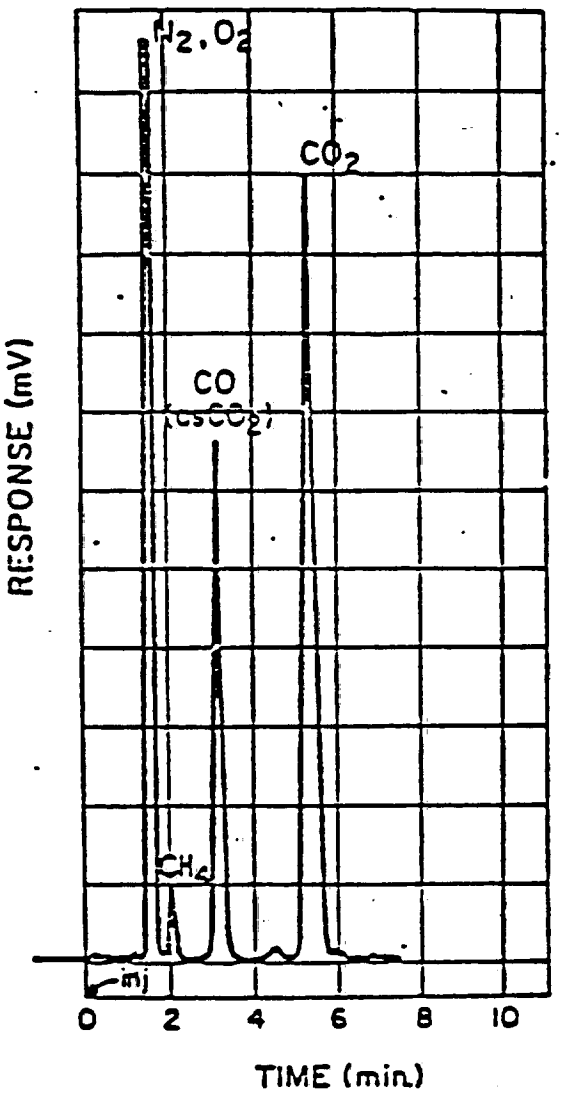

Typical chromatograph of CO and CO_2 in cigarette smoke.

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EXHIBIT A - AFFIDAVIT OF DR. THOMAS B. OWEN

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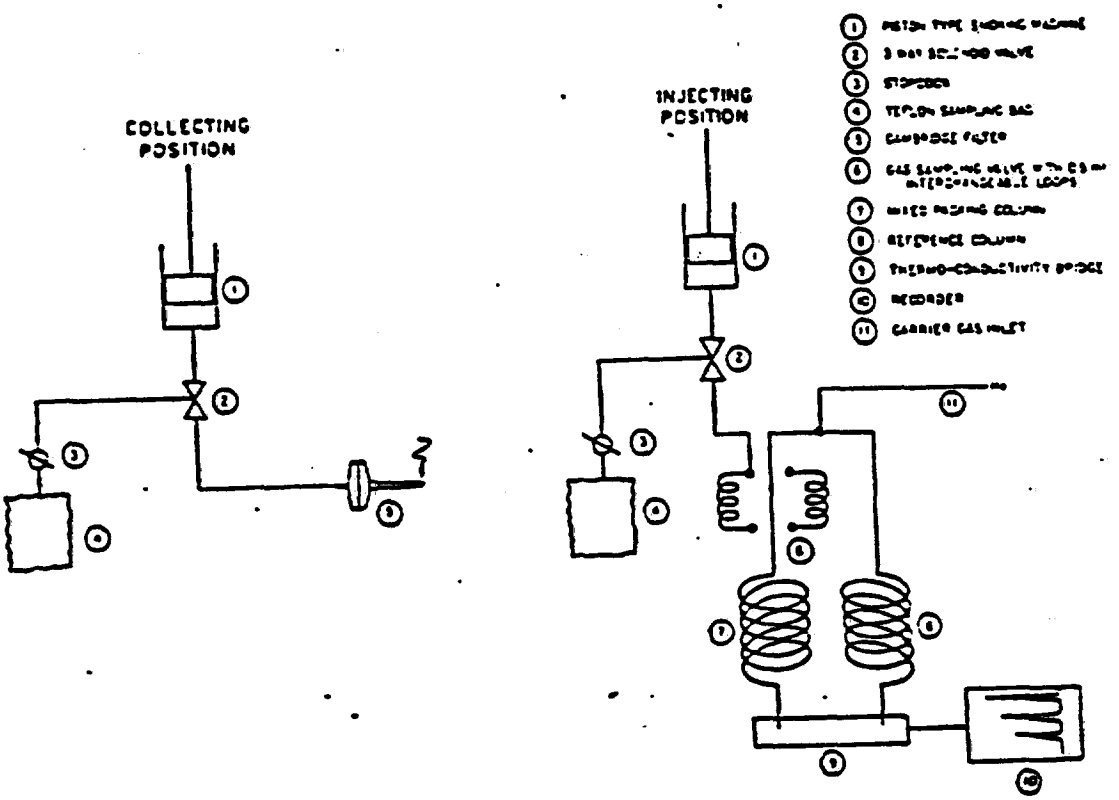
FIGURE 3



Schematic diagram of set-up for the determination of CO and CO_2 in cigarette and cigar smoke

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EXHIBIT A - AFFIDAVIT OF DR. THOMAS B. OWEN

Source: https://www.industrydocuments.ucsf.edu/docs/gfyl0000

TABLE 1

YIELDS OF MAINSTREAM SMOKE CONSTITUENTS

eight mg)	Total Length (mm)	Butt Length (mm)	Burn. Rate (mg/min.)	Draw Res. (mm)	Puffs per Cig.	Wet TPM (mg/cig.)	Nico-tine (mg/cig.)	Water (mg/cig.)	Dry* TPM (mg)	CO Vol. %	CO_2 Vol. %	CO (mg)	CC (mg
100	85	33	71.0	68	7.9	15.6	1.10	1.91	12.5	3.09	7.69	10.	4
2	85	33	26.1	74	12.9	21.9	1.50	2.16	18.2	3.08	7.37	16.7	6
102	85	51	26.1	74	8.0	12.3	0.89	1.77	9.6	2.65	6.47	8.48	3
116	85	58	19.7	104	6.4	6.7	0.55	1.72	4.4	3.74	8.17	9.46	3

* Federal Trade Commission value for TPM = TPM wet minus water minus nicotine[10]

Type 2A data based on 8 puffs
Type 3, experimental variations ± 20%

EXHIBIT A
AFFIDAVIT OF DR. THOMAS B. OWEN

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TABLE 2

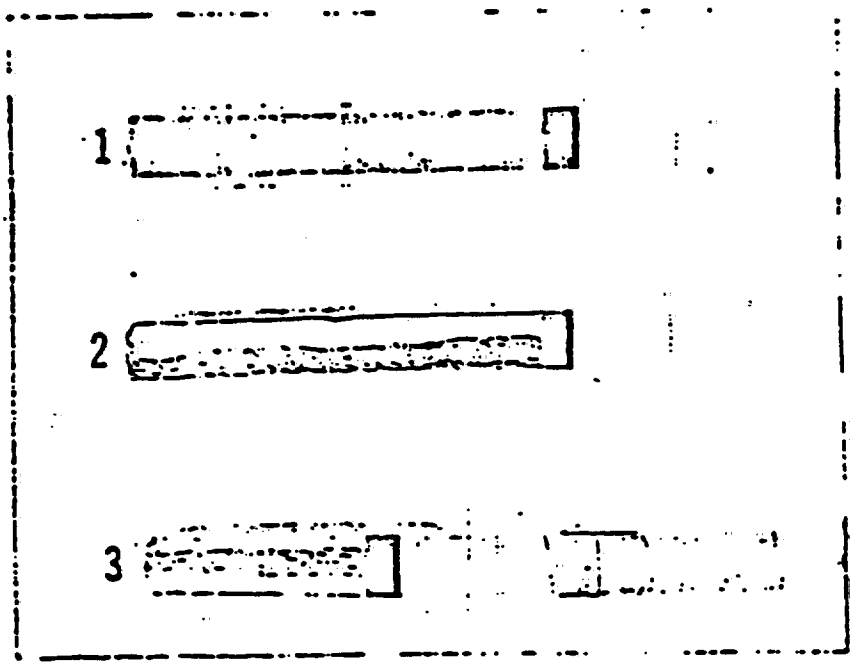
TPM AND NICOTINE IN SIDESTREAM SMOKE

Cigarette Type	Puffs per Cigarette	Wet TPM (mg/cig.)	Nicotine (mg/cig.)	Water (mg/cig.)	Dry TPM * (mg/cig.
1	9.2	20.2	1.59	1.04	17.6
2	13.8	11.5	0.95	0.86	9.7
2A	9.0	8.0	0.90	0.72	7.0
3	7.7	7.4	0.49	0.48	6.4

* See explanation under Table 1

Source: https://www.industrydocuments.ucsf.edu/docs/gfyl0000

FIGURE 1



Polaroid photograph of test cigarettes type 1, 2, and 3

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EXHIBIT A - AFFIDAVIT OF THOMAS B. OWEN

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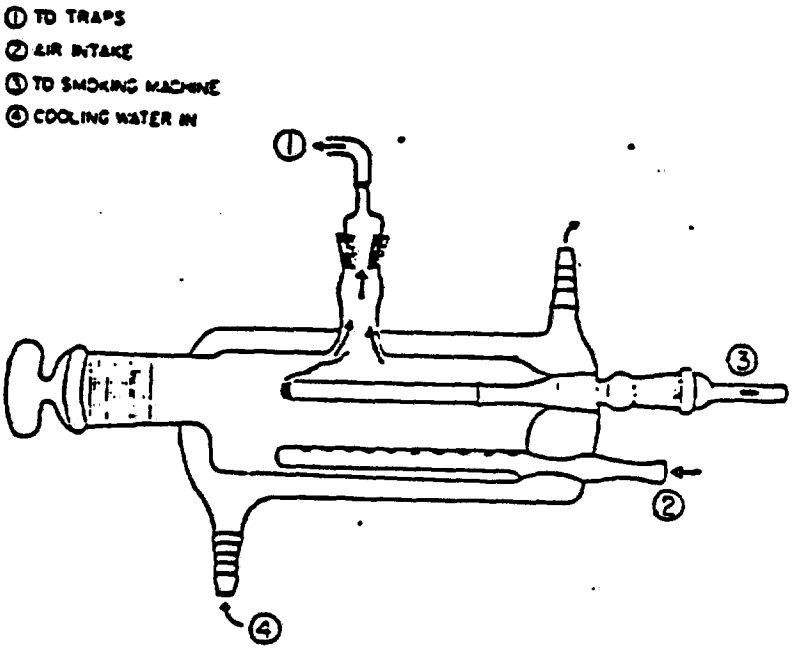

Smoke chamber for determination of TPM and nicotine in sidestream smoke. (Chamber constructed by R.C. Ewald, Inc., Middle Village NY 11379)

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EXHIBIT A - AFFIDAVIT OF DR. THOMAS B. OWEN

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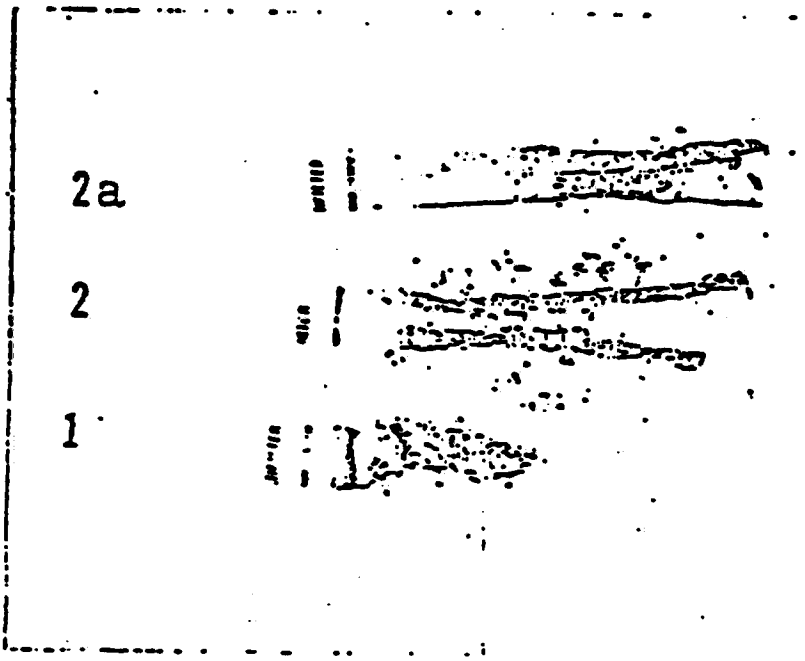
FIGURE 3



Partially smoked test cigarettes

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EXHIBIT A - AFFIDAVIT OF DR. THOMAS B. OWEN

Source: https://www.industrydocuments.ucsf.edu/docs/gfyl0000

DECLARATION OF SERVICE BY MESSENGER

I declare that I am employed in the City and County of San Francisco, California. I am over the age of eighteen years and not a party to this cause. My business address is 505 Sansome Street, 14th Floor, San Francisco, California 94111. On April 26, 1982 I served the foregoing Affidavit of Dr. Thomas B. Owen on all parties in this cause by placing a true copy thereof enclosed in a sealed envelope addressed as follows:

Vasilios B. Choulos, Esq.
30 Hotaling Place
San Francisco, CA 94111

Scott N. Hansen, Esq.
John E. Hill, Esq.
Hill & Hansen
722 Montgomery St.
San Francisco, CA 94111

I declare under penalty of perjury that the foregoing is true and correct, and that this declaration was executed on April 26, 1982 at San Francisco, California.

Dawn Guillory

Dawn Guillory

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